CARY ACADEMY

MIDDLE SCHOOL

MATH CURRICULUM

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CARY ACADEMY

Middle School Curriculum

Math: Grade 6

Math 6 provides an extensive and accelerated foundation for success in Transitional Math. This course is designed for fifth-grade students who are currently performing at the sixth-grade level. Study is conducted within small and large groups incorporating manipulatives, calculators, technology, and real-world applications. Mathematical communication and reasoning are emphasized to enhance student understanding.

TRIMESTER 1

Number Sense

- Divisibility Factors and prime factorization
- Prime and composite numbers
- LCM and GCF
- Abundant, Perfect and Deficient

Fractions

- Fraction Sense
- Multiplication and Division of fractions
- Real world applications

Decimals

- Decimal Sense
- Multiplication and Division of decimals
- Real world applications

Geometry

- Basic Plane Geometry
- Properties of Triangles, Quadrilaterals and Polygons
- Area of Polygons
- Surface Area of rectangular and triangular prisms

TRIMESTER 2

Ratio and Proportion

- Representations of Ratios and Unit
- Rates Setting up and Solving Proportions
- Proportional Reasoning

Percent

- Fraction, Decimal, Percent Equivalences
- Estimation with Percent Benchmarks
- Solving Problems Using the Percent
- Proportion

Statistical Reasoning

- Measures of Central Tendency
- Creating and Manipulating Data Using
- Collect, Organize and Display Data
- Choose Appropriate Statistical Methods to Analyze Data
- Construct and Interpret Tables and Graphs (stem and leaf, box and whisker, scatter plots, line graphs, circle graphs and bar graphs)

Probability

- Experimental vs. Theoretical
- Fundamental Counting Principle
- Tree Diagrams

TRIMESTER 3

Order of Operation and Variable Expressions

- Order of Operations
- Exponents
- Writing and Evaluating Algebraic Expressions
- Properties of Math

Integers

- Integer Value
- Operations with Integers
- Real World Applications

Equations

- Inverse Operations
- Solving One and Two-Step Equations
- Writing Equations

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Middle School Curriculum
Math: Grade 7

Math 7 is a comprehensive course designed to emphasize a full range of topics needed for the successful study of Transitional Math and Algebra I. The major areas to be studied are: application of operations with whole numbers, decimals, fractions and rational numbers; number sense; variables with expressions and equations; number theory; proportional reasoning; geometric figures; and statistics. This emphasis will strengthen and develop reasoning, problem solving, and communication skills needed to apply mathematics to real-life activities. Calculators and technology are incorporated into the curriculum where applicable.

SCOPE AND SEQUENCE

Addition and Subtraction

- Properties of addition and subtraction
- Evaluate algebraic expressions
- Equations solved by adding and subtracting
- Represent and analyze mathematical situations and structures using algebraic symbols

Multiplication and Division

- Properties of multiplication and division
- Order of operations
- Distributive property
- Simplifying expressions
- Equations solved by multiplication and division
- Represent and analyze mathematical situations and structures using algebraic symbols
- Real world applications

Properties

- Using only addition and multiplication
- Properties of addition and multiplication
- Combining like terms
- Inverse operations
- Distributive property
- Order of operations

Number Theory

- Prime factorization
- Least Common Multiple and Greatest Common Factor

Decimals

- Operations with decimals
- Application: Multi-step problems
- Compute fluently and make reasonable estimates
- Integrated throughout the year as applicable to concepts

Fractions

- Operations with fractions
- Write fraction and decimal equivalencies
- Compute fluently and make reasonable estimates
- Integrated throughout the year as applicable to concepts

Integers and Rational Numbers

- Operations with integers
- Opposites and absolute value
- Operations with negative fractions and decimals
- Evaluate expressions with negative fractions, decimals, opposites and absolute value
- Application: represent integers as they relate to real life situations

Equations

- Equations with addition, subtraction, multiplication, and division
- Equations with combined operations
- Translate words into expressions and simple equations
- Solving one-, two- and multi-step equations
- Application to real life problem solving

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SCOPE AND SEQUENCE: MATH GRADE 7 (continued)

Percent and Proportion o Percent and Proportion Fraction, decimal and percent equivalencies o Ratios, proportions and percent o Fractions, decimals and percent o Proportional reasoning o Compute fluently and make reasonable estimates o Compute simple interest **Statistics and Probability** o Mean, Median, and Range o Frequency distributions o Stem-and-leaf plots o Box-and-whisker plots o Histograms o Understand and apply basic concepts of probability o Tree diagrams **Geometric Figures** o Polygons o Regular polygons o Classification of triangles o Classification of quadrilaterals	

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Middle School Curriculum
Transitional Math

Transitional Math implements a shift from manipulative skills to a curriculum that reflects and integrates a broad range of topics in math. These topics include number concepts, number theory, exponents, proportional reasoning, application of percent and computation in addition to functions; algebra, graphing, statistics and data analysis, probability, and geometry. The course connects new concepts to other concepts previously studied, other subject areas, and real-life problem solving situations while incorporating calculators and technology.

SCOPE AND SEQUENCE

Addition and Subtraction

- Properties of addition and subtraction
- Evaluate algebraic expressions
- Equations solved by adding and subtracting
- Represent and analyze mathematical situations and structures using algebraic symbols

Multiplication and Division

- Properties of multiplication and division
- Order of operations
- Distributive property
- Simplifying expressions
- Equations solved by multiplication and division
- Represent and analyze mathematical situations and structures using algebraic symbols

Properties

- Using only addition and multiplication
- Properties of addition and multiplication
- Combining like terms
- Inverse operations Distributive property
- Order of operations

Number Theory

- P Prime factorization
- Least Common Multiple and Greatest Common Factor (including monomials) Real number system

Decimals

- Operations with decimals
- Application: Multi-step problems
- Compute fluently and make reasonable estimates
- Integrated throughout the year as applicable to concepts

Fractions

- Operations with fractions
- Fraction and decimal equivalences
- Compute fluently and make reasonable estimates
- Integrated throughout the year with all topics

Integers and Rational Numbers

- Operations with integers
- Opposites and absolute value
- Operations with negative fractions and decimals
- Evaluate expressions with negative fractions, decimals, opposites and absolute value Application:
- represent integers as they relate to real life situations

Equations and Inequalities

- Solving multiple step equations and inequalities
- Translate words into expressions, equations and inequalities
- Graphing equations and inequalities
- Apply and adapt a variety of appropriate strategies to solve equations and inequalities

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SCOPE AND SEQUENCE: TRANSITIONAL MATH (continued)

Percent and Proportion

- Fraction, decimal and percent equivalencies
- Ratios, proportions and percent
- Proportional reasoning
- Application: Select, apply, and translate among ratio, proportion, and percent to solve problems as they relate to equations
- Compute fluently and make reasonable estimates
- Compute simple and compound interest

Coordinate Plane

- Graphing in the Cartesian coordinate system
- Multiple approaches to graphing linear and non-linear equations
- Solve for y in terms of x
- Identify solutions of linear equations
- Graphing and interpreting graphs using slope

Geometry

- Analyze characteristics and properties of two and three dimensional geometric shapes
- Integrate equations and geometry
- Characteristics of parallel and perpendicular lines, special angles, and polygons
- Similarity of geometric shapes
- The Pythagorean Theorem

Perimeter, Area and Volume

- Perimeter and Area of regular polygons and irregular figures
- Circumference and area of circles
- Surface area of prisms and cylinders
- Volume of prisms, cylinders, pyramids, and cones
- Application: use visualization, spatial reasoning, and geometric modeling to solve problems

Probability

- Understand and apply basic concepts of probability
- Experimental and theoretical probability
- Mutually exclusive events
- Odds, independent events

Exponents

- Perfect squares and square roots
- Perfect cubes and cubed roots
- Positive and Negative Exponents
- Exponential relationships among monomials

Trigonometric Functions

- Sine, cosine, and tangent functions
- Integration of trigonometric functions with science

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Middle School Curriculum

Algebra

In this course, students begin by learning the basic rules, methods and concepts of Algebra. They will then explore linear equations, inequalities, polynomials, and quadratic equations. The development of both a symbolic and graphical understanding of the mathematics is emphasized. The integration of statistics and geometry into the course helps students to develop a better understanding of how different concepts relate to one another. Students are also regularly asked to apply their understanding of the mathematics to real-world situations. Working on projects and learning to use technology appropriately are integral parts of the course.

SCOPE AND SEQUENCE

Rules of Algebra

- Real numbers
- Order of operations
- Absolute value
- Properties
- Variables
- Variable expressions

Equations

- One and two-step equations
- Equations with variables on both sides, including parentheses
- Problem solving

Polynomials

- Basic operations with monomials
- Positive and negative exponents
- Scientific notation
- Operations with polynomials
- Problem solving with polynomials

Factoring Polynomials

- Division with monomials
- Monomial factors of polynomials
- Multiplying binomials
- Differences of two squares
- Squares of binomials
- Factoring patterns
- Problem solving with factoring

Applying Fractions

- Ratios and proportions
- Equations with fractional coefficients
- Fractional equations
- Problem solving with percents
- Problem solving with mixtures
- Similar triangles involving proportions
- Trigonometric ratios
- Problem solving with trigonometry
- Applications to real life situations

Functions

- Equations in two variables
- Points, lines, and their graphs
- Slope of a line
- Slope-intercept form of a linear equation
- Determining the equation of a line
- Functions defined by tables and graphs
- Functions defined by equations
- Linear functions Statistics with line of regression
- Predictions involving data

Systems of Linear Equations

- Graphing method
- Substitution method
- Addition-or-subtraction method
- Linear Combination Method
- Problem solving with linear equations

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SCOPE AND SEQUENCE: MATH ALGEBRA (continued)

Inequalities o Order of real numbers o Solving inequalities o Combined inequalities o Absolute value inequalities o Graphing linear inequalities o Systems of linear inequalities o Problem solving with inequalities **Rational and Irrational Numbers** o Properties Decimal forms o Rational and irrational square roots o The Pythagorean Theorem o Operations with radicals o Multiplication of binomials containing radicals o Radical equations o Problem solving with radicals **Quadratic Functions** o Quadratic equations with perfect squares o Completing the square o Quadratic formula o Graphs of quadratic functions o Determining the vertex of a parabola o Line of symmetry for a parabola o Problem solving involving quadratic equations **Exponential Functions** o Growth and decay o Compound interest o Applications of cell division	

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Middle School Curriculum

Geometry

Students proceed through the standard Euclidean geometry course emphasizing deductive reasoning, sequential analysis, and proof. Logic plays a critical role in the development of properties for planar and spatial figures. Students will also perform basic constructions and represent geometric figures in the Cartesian plane. Algebra is reinforced throughout the course. Students also learn to apply geometry to real-world problems. Appropriate technology will be used throughout the course.

SCOPE AND SEQUENCE

Language and Tools of Logic

- If...then statements
- Conditional, Converse, Inverse, Contrapositive
- Logical Equivalence
- Venn Diagrams Simple Logic Rules
- Logic Proofs (two column form)

Point, Line, Plane, Angle

- Postulates
- Existence and Uniqueness
- Collinearity
- Segments
- Rays
- Distance
- Angle Measurement
- Midpoint
- Perpendicularity

Parallelism

- Transversals
- Special Angles
- If and only if Statements
- Formal Two Column Proofs Using Postulates and Theorems
- Triangle Angle Sum
- Polygons

Congruent Triangles

- Congruence as a Concept (Size and Shape)
- ASA, SAS, SSS
- Isosceles Triangle Theorems
- AAS, HL
- Altitudes, Medians, Angle Bisectors, Perpendicular Bisectors
- Concurrence & Locus
- Proofs Involving More Than One Pair of Congruent Figures

Quadrilaterals

- Parallelograms
- Rhombus, Rectangle, Square
- Trapezoids Indirect
- Proofs
- Inequalities

Similarity

- Congruence vs. Similarity
- Ratio and Proportion
- Similar Polygons
- AA, SAS, SSS Similarity
- Triangle Similarity Theorems

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Right Triangles

- Geometric Means
- Pythagorean Theorem & Its Converse
- Pythagorean Triples
- Classifying Triangles
- Special Right Triangles
- Basic Trigonometric Ratios
- Angles of Elevation & Depression
- Law of Sines

Circles

- Locus Review
- Basic Terms
- Arcs
- Tangents & Secants
- Central Angles
- Inscribed Angles
- Angles formed by Chords, Tangents, and Secants
- Power Theorems

Constructions & Loci

- Compass & Straightedge
- The Meaning of Construction
- Perpendiculars & Parallels
- Concurrence Review
- Circle Constructions
- Circumcenter & Incenter
- The Meaning of Locus
- Locus & Construction

Area

- Area Postulates
- Rectangle Area
- Area of Parallelogram, Triangle, Trapezoid
- Area of Regular Polygons
- Special Area Formulas (Equilateral Triangle, Rhombus, Kite)
- Circle Area & Circumference
- Arc Length & Sector Area
- Area of Similar Figures

Volume

- Prisms
- Pyramids
- Cylinders & Cones
- Spheres
- Areas & Volumes of Similar Solids

Coordinate Geometry

- Distance Formula
- Slope
- Midpoint
- Circles
- Parallel & Perpendicular Lines
- Equation of a Line
- Coordinate Geometry Proofs

Extensions/tools

- Non-Euclidean Geometries (Spherical, etc.)
- Tessellations
- Transformations

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Philosophy of the Math Program at Cary Academy

The math teachers of Cary Academy seek to create a student experience that enriches and nurtures students' mathematical development. We accomplish this by

- Routinely reflecting on our curriculum objectives to ensure the skills, concepts, and applications we teach are relevant and useful for students to navigate their world.
- Vertically aligning our curriculum so that students will develop and build on their understandings in previous courses.
- Developing course specific assessments that provide objective feedback to the student, teacher, and parent.
- Collaborating within a subject to ensure all students are exposed to effective teaching practices that will deepen and enhance their understanding.
- Seeking out best practices through professional development that requires reflection, sharing, and communicating with peers both inside and outside of Cary Academy.

Portrait of a Cary Academy Math Student

A student engaged in mathematics at Cary Academy is one who

- Develops a mathematical library of skills, abilities, and resources and calls upon it when confronted with novel situations.
- Engages in problem solving by taking risks as he or she explores problems, makes mistakes and learns from them, and persists until a solution is found.
- Collaborates to develop, discuss, and deepen mathematical understandings.
- Abstracts real world contexts into the language of mathematics.
- Uses technology to purposefully and productively illuminate concepts while recognizing its limitations.